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BULLETIN
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***Pinus edulis* and *P. monophylla*.**—On reading Dr. Newberry's note on these trees (BULLETIN, p. 50), it occurred to me that I might have placed more value on the monophyllous character as a specific distinction than it deserved. Having plants of both of some age growing on my grounds, and growing within a few score feet of each other, I thought to watch them closely this summer. The result is, I think Dr. Newberry's views correct. The observation led to some interesting facts which may be worth placing on record.

Dr. Newberry believes the *P. monophylla* is "a somewhat dwarfed and depauperate form" of *edulis*. That this is correct is evidenced by the tendency to produce free leaves, which, as I showed in my paper on Adnation in Coniferæ, published some years ago in the Proceedings of the Chicago meeting of the American Association for the Advancement of Science, is evidence of a decline in vegetative vigor and attendant on depauperate forms.

In closely examining the young monophyllous growth early in the season, I found that by a light tap at the apex it divided and gave the two leaves of *P. edulis*. It is evident that the plant is only monophyllous from the want of power, by reason of its depauperate condition, to burst the membrane enveloping the fascicle in its early stages. It would scarcely do to claim a specific character for a condition which depends for its existence on a membrane so slight as this. It occurred to me then to examine the young growth of other species of pine, and I think I may almost say that, "as a general rule, all pines are monophyllous in the early stages of growth"; at least the divisions of the fascicle are held together by a thin membrane which is ruptured by a tendency to recurve from the apex. The extreme point of the fascicle is free, and, with the tendency to recurve, division follows. On a vigorous specimen of white pine, about seven feet high, I found a very large number of monophyllous bundles—as many as ten on one growing branch. A light tap on the apex, as in the case of *Pinus monophylla*, separated the sections. It was my thought to send the results of my observations then, but concluded to wait to see how long these bundles would retain the monophyllous character. Little by little they split apart, till to-day there is but one left, so far as I can find. It is evident that, with a slightly weakened power to expand from the apex, the white pine might present a monophyllous form.

Another interesting fact, though not connected with the main purpose of this note, is that the free apex of the monophyllous bundle shows it to be composed of three leaves, each a trifle shorter

than the other. This indicates that a fascicle of pine-leaves is a depressed spiral, and that the "needles" are true leaves and not modifications of branches, as I was once inclined to believe. The bundle of "needles" is but an arrested branch, having a dormant bud at the apex, and which may even push and make a shoot in after years, as I have observed of late in Scotch pines that have been headed back. I send some fascicles that have been forced into growth from a three-year-old branch. The leaves of the pine may properly be said to proceed from hidden spurs.

THOMAS MEEHAN.

The Growth of Trees.—The appearance of lateral and terminal buds upon the new growth of trees and shrubs indicates, of course, the cessation of longitudinal growth for the season. Subsequent vegetative efforts are directed to the lignification of the tissues thus formed. The time occupied with this preliminary extension of growth is short as compared with that of its after development.

In the summer of 1884, in South-western New York, at about latitude $41^{\circ} 21'$, I noted the dates when the common woody plants had formed their buds. The results were rather surprising, though of course the observations are not to be considered as new or original. Collectively, however, they call attention to a condition of the growth not generally recognized.

As soon as June 1st the following trees and shrubs had formed both lateral and terminal buds: *Tilia Americana*, L., *Acer saccharinum*, Wang., *Acer rubrum*, L., *Hamamelis Virginica*, L., *Amelanchier Canadensis*, L., *Sambucus pubens*, Michx., *Kalmia latifolia*, L., *Ulmus Americana*, L., *U. fulva*, Michx., *Carya alba*, Nutt., *Quercus alba*, L., *Q. bicolor*, Willd., *Q. Prinus*, L., var. *monticola*, Michx., *Q. coccinea*, Wang., and *Fagus ferruginea*, L., *Populus tremuloides*, Michx., and *Fraxinus Americana*, L. Fifteen days later these were added to the list as having completed their longitudinal growth for the season: *Prunus Cerasus*, L., *Juglans nigra*, L., *Ostrya Virginica*, Willd., *Carpinus Americana*, Michx., *Betula lenta*, L., *Castanea vesca*, L., *Morus rubra*, L., *Lindera Benzoin*, Meisner.

July 19th, terminal and lateral buds were found on *Staphylea trifolia*, L., *Nyssa multiflora*, Wang., *Andromeda ligustrina*, Muhl., and *Alnus incana*, Willd.

These dates were fixed, not upon single, but, upon several specimens of each species. Some other species continued to grow throughout the season, or at least until near its close, without producing terminal buds. The more prominent of these were *Liriodendron Tulipifera*, L., species of *Vitis*, *Ampelopsis quinquefolia*, Michx., *Celastrus scandens*, L., species of *Rhus*, etc.

In this latitude, most trees and shrubs put forth their leaves from the 1st to the 15th of May, although the Cupuliferæ are rather behind this date. It seems, therefore, that our hardiest and most valuable deciduous forest trees, the oaks, maples, hickories, elms, birches, ashes, and the beech and aspen produce all their annual growth *in extension* in from three to six weeks from the date when growth commences. The remaining three months, more or less, are devoted to